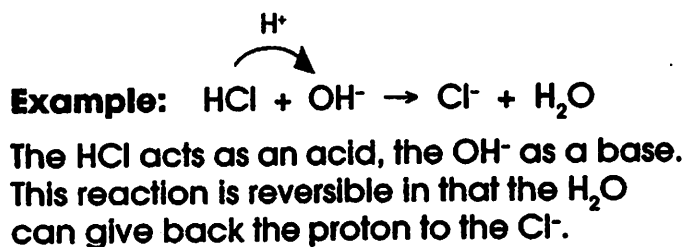


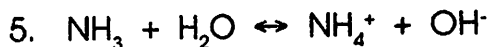
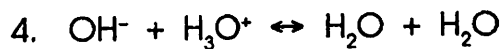
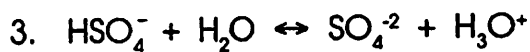
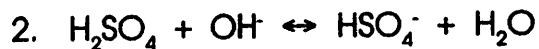
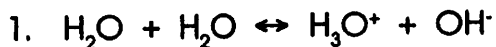
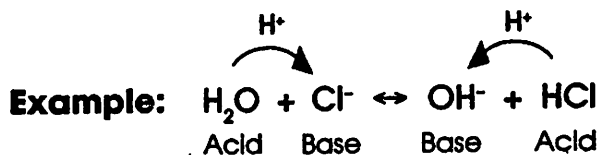
BRONSTED-LOWRY ACIDS AND BASES

Name _____

According to Bronsted-Lowry theory, an acid is a proton (H^+) donor, and a base is a proton acceptor.



Label the Bronsted-Lowry acids and bases in the following reactions and show the direction of proton transfer.



CONJUGATE ACID-BASE PAIRS

Name _____

In the exercise, Bronsted-Lowry Acids and Bases, it was shown that after an acid has given up its proton, it is capable of getting back that proton and acting as a base. Conjugate base is what is left after an acid gives up a proton. The stronger the acid, the weaker the conjugate base. The weaker the acid, the stronger the conjugate base.

Fill in the blanks in the table below.

Conjugate Pairs

	ACID	BASE	EQUATION
1.	H_2SO_4	HSO_4^-	$\text{H}_2\text{SO}_4 \leftrightarrow \text{H}^+ + \text{HSO}_4^-$
2.	H_3PO_4		
3.		F^-	
4.		NO_3^-	
5.	H_2PO_4^-		
6.	H_2O		
7.		SO_4^{2-}	
8.	HPO_4^{2-}		
9.	NH_4^+		
10.		H_2O	

Which is a stronger base, HSO_4^- or H_2PO_4^- ? _____

Which is a weaker base, Cl^- or NO_2^- ? _____

pH AND pOH

Name _____

The pH of a solution indicates how acidic or basic that solution is.

pH range of 0 - 7 acidic

7 neutral

7-14 basic

Since $[H^+][OH^-] = 10^{-14}$ at $25^\circ C$, if $[H^+]$ is known, the $[OH^-]$ can be calculated and vice versa.

$$pH = -\log [H^+]$$

$$\text{So if } [H^+] = 10^{-6} M, pH = 6.$$

$$pOH = -\log [OH^-]$$

$$\text{So if } [OH^-] = 10^{-8} M, pOH = 8.$$

$$\text{Together, } pH + pOH = 14.$$

Complete the following chart.

	$[H^+]$	pH	$[OH^-]$	pOH	Acidic or Basic
1.	$10^{-6} M$	5	$10^{-9} M$	9	Acidic
2.		7			
3.			$10^{-4} M$		
4.	$10^{-2} M$				
5.				11	
6.		12			
7.			$10^{-5} M$		
8.	$10^{-11} M$				
9.				13	
10.		6			

pH AND pOH CONTINUED

Name _____

Calculate the pH of the solutions below.

1. 0.01 M HCl

2. 0.0010 M NaOH

3. 0.050 M $\text{Ca}(\text{OH})_2$

4. 0.030 M HBr

5. 0.150 M KOH

6. 2.0 M $\text{HC}_2\text{H}_3\text{O}_2$ (Assume 5.0% dissociation.)

7. 3.0 M HF (Assume 10.0% dissociation.)

8. 0.50 M HNO_3

9. 2.50 M NH_4OH (Assume 5.00% dissociation.)

10. 5.0 M HNO_2 (Assume 1.0% dissociation.)

ACID-BASE TITRATION

Name _____

To determine the concentration of an acid (or base), we can react it with a base (or acid) of known concentration until it is completely neutralized. This point of exact neutralization known as the endpoint, is noted by the change in color of the indicator.

We use the following equation:

$$N_A \times V_A = N_B \times V_B \quad \text{where } N = \text{normality} \\ V = \text{volume}$$

Solve the problems below.

1. A 25.0 mL sample of HCl was titrated to the endpoint with 15.0 mL of 2.0 N NaOH. What was the normality of the HCl? What was its molarity?

2. A 10.0 mL sample of H_2SO_4 was exactly neutralized by 13.5 mL of 1.0 M KOH. What is the molarity of the H_2SO_4 ? What is the normality?

3. How much 1.5 M NaOH is necessary to exactly neutralize 20.0 mL of 2.5 M H_3PO_4 ?

4. How much of 0.5 M HNO_3 is necessary to titrate 25.0 mL of 0.05 M $\text{Ca}(\text{OH})_2$ solution to the endpoint?

5. What is the molarity of a NaOH solution if 15.0 mL is exactly neutralized by 7.5 mL of a 0.02 M $\text{HC}_2\text{H}_3\text{O}_2$ solution?

Titration

1. How many millilitres of 0.100 M HCl are required to neutralize 25.0 mL of 0.100 M Ba(OH)_2 ?
2. What is the molarity of a hydrochloric acid solution, 30.0 mL of which is just neutralized by 48.0 mL of 0.100 M NaOH?
3. Exactly 50.0 mL of HClO solution of unknown concentration was titrated with 0.100 mol NaOH. An end point was reached when 38.5 mL of the base was added. Calculate the molar concentration of the HClO solution.
4. Calculate the pH of the resulting solution after 20.00 mL of 0.20 M NaOH has been added to 25.00 mL of 0.20 M HCl.
5. 100.00 mL of 0.100 M potassium hydroxide is titrated with 0.200 M nitric acid. Calculate the volume of nitric acid required to reach the equivalence point.